Course Syllabus

<table>
<tr><td>Course Number</td><td colspan="4">MATH1020</td></tr>
<tr><td>Course Name</td><td colspan="4">Pre-Calculus</td></tr>
<tr><td>Course Instructor</td><td colspan="4">Name: Dr. Maha Dewidar
E-mail: maha.dewidar@udst,edu.qa
Office: 7.2.44
Phone: 44952078
Office Hours: See D2L for weekly office hours.</td></tr>
<tr><td rowspan="6">Specific Course Information</td><td colspan="4">Course Description</td></tr>
<tr><td colspan="4">This course focuses on developing essential technical mathematical skills in functions and analytical trigonometry to ensure success in subsequent math courses. Students learn to identify and describe the effects of transformation on both algebraic and graphical forms of polynomial, rational, exponential, and logarithmic functions. In addition, they analyse the behaviours of functions and use the properties of functions to solve equations and application problems. Students gain a solid foundation in the study of trigonometric functions and their applications in real-world contexts, in addition to analytical trigonometric concepts applied to polar coordinate systems. Through a variety of student-centred investigations, real-life applications, and adaptive learning technologies, students learn to effectively practice mathematical reasoning and symbolic analysis in their pursuit of lifelong learning.</td></tr>
<tr><td>Prerequisites</td><td>MATH1010 or
AMPII Score of 75%</td><td>Co-requisites</td><td>-</td></tr>
<tr><td colspan="4">The course is (elective, or selected elective, or required by the program)</td></tr>
<tr><td colspan="4">Required</td></tr>
<tr><td>Course Schedule & Location</td><td colspan="4">Days/Times:
Location:</td></tr>
<tr><td rowspan="3">Credit/Contact Hours</td><td colspan="4">Credit Hours: 3</td></tr>
<tr><td colspan="4">Contact hours: 3</td></tr>
<tr><td colspan="2">Lecture: 3</td><td colspan="2">Lab: 0</td></tr>
<tr><td>Textbook</td><td colspan="4">Miller, J., & Gerken, D. (2023). Precalculus Integrated with ALEKS 360 (2nd ed.). McGraw Hill. ISBN13: 9781260260458</td></tr>
<tr><td>Additional Materials</td><td colspan="4">MATH1020 Lecture Notes</td></tr>
<tr><td rowspan="3">Course Goals</td><td></td><td>Course Learning Outcomes (CLO's)</td><td colspan="2">Course Sub-Learning Outcomes (CSLOs)</td></tr>
<tr><td>CLO1</td><td>Represent and manipulate algebraic functions and relations algebraically, graphically, and numerically</td><td colspan="2">CSLO 1: Create different representations of functions to model the relationships between variables, visually and symbolically as graphs, equations and tables.
CSLO2: Make connections by extending the results from a specific case to a general form between related functions to better understand physical phenomena.
CSLO3: Use adaptive technology to apply knowledge of functions to solve real-life problems</td></tr>
<tr><td>CLO2</td><td>Describe key features of polynomial and rational functions, both algebraically</td><td colspan="2">CSLO2: Make connections by extending the results from a specific case to a general form between</td></tr>
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		and graphically, and make connections between their representations.	related functions to better understand physical phenomena. **CSLO3**: Use adaptive technology to apply knowledge of functions to solve real-life problems **CSLO4:** Evaluate polynomial and rational functions and their graphs
	CLO3	Examine exponential and logarithmic functions and their properties, both algebraically and graphically.	**CSLO2**: Make connections by extending the results from a specific case to a general form between related functions to better understand physical phenomena. **CSLO3**: Use adaptive technology to apply knowledge of functions to solve real-life problems **CSLO5**: Solve logarithmic and exponential equations
	CLO4	Analyze the properties of trigonometric graphs and utilize them to model and predict various periodic phenomena in real-world applications.	**CSLO6:** Make connections between the properties of trigonometric graphs and their general forms, to extend understanding of periodic phenomena and their mathematical representations in real-world contexts. **CSLO7:** Leverage adaptive technology and knowledge of trigonometric graph properties to effectively solve real-life problems. **CSLO8:** Develop an understanding of trigonometric functions and their periodic nature, including graphing techniques, to proficiently analyze and model various periodic phenomena encountered in mathematical contexts.
	CLO5	Demonstrate a comprehensive understanding of basic trigonometric identities and formulas, and proficiently apply double angles and half angles in solving trigonometric equations.	**CSLO9:** Use angle formulas for sine, cosine, and tangent to evaluate trigonometric expressions, demonstrating proficiency in trigonometric calculations and formula application. **CSLO10:** Isolate trigonometric functions by applying algebraic skills and integrating the concept of a periodic function to find all solutions to trigonometric equations. **CSLO11:** Solve complex trigonometric problems through algebraic manipulation and periodicity analysis.
	CLO6	Develop an understanding of the polar coordinate system as an alternate way of describing the position of a point in a plane	**CSLO12**: Utilize complex numbers and polar coordinates in different forms to perform mathematical operations **CSLO 13**: Justify the need for a complex number system and explain how it is related to other existing number systems
	CLO7	Demonstrate understanding of English language	**CSLO 1**: Create different representations of functions to model the relationships between

		vocabulary and terminology in advanced technical mathematics concepts of precalculus	variables, visually and symbolically as graphs, equations and tables. **CSLO2**: Make connections by extending the results from a specific case to a general form between related functions to better understand physical phenomena. **CSLO3**: Use adaptive technology to apply knowledge of functions to solve real-life problems **CSLO4:** Evaluate polynomial and rational functions and their graphs **CSLO5**: Solve logarithmic and exponential equations **CSLO6:** Make connections between the properties of trigonometric graphs and their general forms, to extend understanding of periodic phenomena and their mathematical representations in real-world contexts. **CSLO7:** Leverage adaptive technology and knowledge of trigonometric graph properties to effectively solve real-life problems. **CSLO8:** Develop an understanding of trigonometric functions and their periodic nature, including graphing techniques, to proficiently analyze and model various periodic phenomena encountered in mathematical contexts. **CSLO9:** Use angle formulas for sine, cosine, and tangent to evaluate trigonometric expressions, demonstrating proficiency in trigonometric calculations and formula application. **CSLO10:** Isolate trigonometric functions by applying algebraic skills and integrating the concept of a periodic function to find all solutions to trigonometric equations. **CSLO11:** Solve complex trigonometric problems through algebraic manipulation and periodicity analysis. **CSLO12**: Utilize complex numbers and polar coordinates in different forms to perform mathematical operations **CSLO 13**: Justify the need for a complex number system and explain how it is related to other existing number systems
	Major Topics		**Hours**
	Topic 1	Functions and Relations	12
	Topic 2	Polynomial and Rational Functions	6
	Topic 3	Exponential and Logarithmic Functions	12

	Topic 4	Trigonometric Functions	6
	Topic 5	Analytic Trigonometry	6
	Topic 6	Polar Coordinates and Complex Numbers	3

Course Weighting (Fall/Winter)	
Assessment	**Weight %**
Assignments	15%
Quizzes	25%
Midterm Exam	30%
Final Exam	30%

Passing Grade	60%

Topics Planner	
Week	**Topics**
Week 1	1. **Functions and Relations** 1. Determine Whether a Relation Is a Function 2. Apply Function Notation 3. Determine Domain and Range of a Function 4. Interpret a Function Graphically 5. Function Notation from Algebraic Statements 6. Perform Operations on Functions 7. Evaluate a Difference Quotient **Readings and Practice** • Section 1.3 pg. 137 – 151 • Section 1.3 Q #'s 9-70, 75-84, 87-100, 103, 104, 107-110 • Section 1.8 pg. 216 – 220 • Section 1.8 Q #'s 5-32, 33-44
Week 2	8. Compose and Decompose Functions 9. Applications of Functions 9. Identify One-to-One Functions 10. Determine Whether Two Functions Are Inverses 11. Find the Inverse of a Function 12. Applications of Inverse Function

	Readings and Practice • Section 1.8 pg. 220 – 229 • Section 1.8 Q #'s 47-64, 65-82, 83-86, 99-110 • Section 3.1 pg. 356 – 368 • Section 3.1 Q #'s7-30, 31-36, 41-50, 53-58, 61-66, 71-76, 81-86
Week 3	13. Recognize Basic Functions 14. Apply Vertical and Horizontal Translations 15. Apply Vertical and Horizontal Shrinking and Stretching 16. Apply Reflections Across the x-Axis, y-Axis and origin 17. Summarize Transformations of Graphs 18. Identify Even and Odd Functions **Readings and Practice** • Section 1.6 p. 183-192 • Section 1.6 Q #'s 1-60, 63-789, 79-90, 95-100 • Section 1.7 p. 199-200 • Section 1.7 Q #'s 21-46
Week 4	19. Analyse Piecewise-Defined Function 20. Graph Piecewise-Defined Functions 21. Applications of Piecewise-Defined Functions 22. Investigate Increasing, Decreasing, and Constant Behavior of a Function 23. Determine Relative Maxima and Minima of a Function **Readings and Practice** • Section 1.7 p. 201-208 • Section 1.7 Q #'s 47-70, 87--108, 111-112
Week 5	2. **Polynomial and Rational Functions** 1. Determine the End Behavior of a Polynomial Function 2. Identify Zeros of Functions 3. Apply the Intermediate Value Theorem 4. Sketch a Polynomial Function **Readings and Practice** • Section 2.1 pg. 254 – 264 • Section 2.1 Q #'s 13-20, 23-32, 39-44, 45-76
Week 6	6. Apply Notation Describing Infinite Behavior of a Function 7. Identify Vertical Asymptotes 8. Identify Horizontal Asymptotes 9. Graph Rational Functions 10. Use Rational Functions in Applications **Readings and Practice** • Section 2.5 pg. 299 – 315 • Section 2.5 Q #'s 7-38, 49-90, 91-97
Week 7	3. **Exponential and Logarithmic Functions** 1. Graph Exponential Functions 2. Apply Vertical and Horizontal Translations on Exponential Functions 3. Evaluate the Exponential Function Base e 4. Graph f(x) = ex

	Readings and Practice • Section 3.2 pg. 368-372 • Section 3.2 Q #'s 9-36, 37-44
Week 8	5. Definition of Logarithmic Function 6. Convert Between Logarithmic and Exponential Forms 7. Evaluate Logarithmic Expressions 8. Apply Basic Properties of Logarithms 9. Graph Logarithmic Functions 10. Identifying the Domain of a Logarithmic Function 11. Use Transformations to Graph Logarithmic Functions **Readings and Practice** • Section 3.3 381-391 • Section 3.3 Q 9-24, 25-50, 55-64, 65-92
Week 9	12. Applying the Product Property of Logarithms 13. Applying the Quotient Property of Logarithms 14. Applying the Power, Product, and Quotient Properties of Logarithms 15. Write a Logarithmic Expression in Expanded Form 16. Write a Logarithmic Expression as a Single Logarithm 17. Apply the Change-of-Base formula **Readings and Practice** • Section 3.4 pg. 397-403 • Section 3.4 Q #'s 7-68, 79-84, 89-98
Week 10	18. Solve Exponential Equations 19. Solve Logarithmic Equations 20. Solve Literal Equations for a Specified Variable 21. Create Models for Exponential Growth and Decay **Readings and Practice** • Section 3.5 pg. 406- 414 • Section 3.5 Q #'s 5-34, 35-60 • Section 3.6 pg. 420-426 • Section 3.6 Q #'s 5-14, 15-22
Week 11	4. **Trigonometric Functions** 1. Evaluate Trigonometric Functions of Any Angle 2. Determine Reference Angles 3. $y = A\sin(Bx - C) + D$ Evaluate Trigonometric Functions using Reference Angles 4. $y = A\cos(Bx - C) + D$ Graph and identify the key points on one full period 5. Graph and identify the key points on one full period 6. Identify the amplitude, period, phase shift, and vertical shift **Readings and Practice** • Section 4.4 pg. 497-504 • Section 4.4 Q #'s 7-76 • Section 4.5 pg. 508-516 • Section 4.5 Q #'s 15-32, 37-48, 55-58
Week 12	7. Applications of Trigonometric Equations 8. Word problem involving a sine or cosine function

	9. Developing a sinusoidal model for a real-world situation **Readings and Practice** • Section 4.5 pg. 518-519 • Section 4.5 Q #'s 69-76
Week 13	5. **Analytic Trigonometry** 1. Simplify Trigonometric Expressions Using Fundamental Identities 2. Apply the Sum and Difference Formulas for Sine, Cosine and Tangent 3. Apply the Double-Angle Formulas for Sine, Cosine, and Tangent 4. Apply the Half-Angle Formulas for Sine, Cosine, and Tangent **Readings and Practice** • Section 5.1 pg. 568-570 • Section 5.1 Q #'s 7-36 • Section 5.2 Examples 1, 2, 3 • Section 5.2 Q #'s 27-32 • Section 5.3 Examples 1, 4, 5, 6 • Section 5.3 Q #'s 7-14, 39-44, 47-50
Week 14	6. Solve Trigonometric Equations In Linear Form 7. Solve Trigonometric Equations Containing: • Multiple Angles • Half-Angle • Compound Angle 8. Solve Higher Degree Trigonometric Equations: • Quadratic Trigonometric Equations • Trigonometric Equation by Factoring **Readings and Practice** • Section 5.5 p. 607-613 • Section 5.5.5 Q #'s 5-18, 23-32, 33-42
Week 15	**6. Polar Coordinates and Complex Numbers** 1. Plot Points Using Polar Coordinates 2. Find Multiple Representations of a Point in Polar Coordinates for r>0 3. Convert Ordered Pairs Between Polar and Rectangular Coordinates 4. Simplify Imaginary Numbers 5. Perform Operations on Complex Numbers 6. Plot Complex Numbers in the Complex Plane 7. Compute Products and Quotients of Complex Numbers in Polar Form 8. Compute Powers of Complex Numbers (DeMoivre's Theorem) **Readings and Practice** • Section R.6 pg. 71 – 77 • Section R.6 Q #'s 7-56 • Section 7.1 pg. 686 – 696 • Section 7.1 Q #'s 7-22 (r>0), 23-44, • Section 7.3 pg. 713 – 725 • Section 7.3 Q #'s 7-52

Resources & Policies
Please use the following links to access university resources and policies or visit www.udst.edu.qa **Resources** Academic Help Centers A variety of Help Centers are available online and have a physical location on campus. Student Counselling and Accessibility Services Student Counselling and Accessibility Services provide free, supportive, and confidential counselling services to all registered UDST students. Library Students and Faculty go to the Library and Learning Commons to complete research, use computers, individual or group study rooms, study carrels, and more. **Policies and Procedures** Policies All university Policies and Procedures are available through this link, or go directly to common student policies by choosing the items below. Student Conduct Policy Student Attendance Policy Student Appeals Policy Academic Standing Policy Final Grade Policy

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Date Approved:	26/08/2025			
Approved by:	Head of Department, Mathematics			